Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Magnetic Resonance and Electrical Conductivity in Mixed Porosity Systems S. RYU, Schlumberger, Z. ZHANG, U. Rhode Island, L. SCHWARTZ, D. JOHNSON, Schlumberger — Many composite materials exhibit a wide range of pore sizes. In reservoir rocks one often sees macro-pores that are 20–50 μm in diameter and micro-pores whose size can be 100 times smaller. Spatially, the macro and micro-pores can be arranged either in series, in parallel or a combination of the two. We present the results of numerical simulations on mixed porosity systems based on the packing of grains and on data derived from x-ray microtomography (μCT). We begin with ordered packings of overlapping spherical grains. Micro-porosity is introduced in one of two ways – we can have a micro-porous layer coating each grain or the grains can be comprised of smaller grains. In both cases we take the ratio of macro to micro pore diameters to be in the realistic range between 20 and 100. We will present numerical simulations of electrical conductivity and surface-induced proton spin relaxation. In calculations based on carbonate μCT data we find that the connected pathways almost always involve transport and diffusion through the micro-pores.

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Date submitted: 18 Nov 2009 Electronic form version 1.4